

WYO-BIO

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WHAT'S NEW IN BIOLOGICAL CONTROL OF PERENNIAL PEPPERWEED?

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Since 2006, the Wyoming Biological Control Steering Committee has been providing financial support for the work on biological control of perennial pepperweed (PPW; scientific name: *Lepidium latifolium*) at CABI Europe - Switzerland. Some of you receive our annual report, jointly produced by BBCA and CABI E-CH – but for those who do not, we would like to summarize the achievements so far and outline our plans for the future.

The first step in any biological control project is a literature survey to identify insects, mites or fungi associated with a target weed in its area of origin. In the case of PPW, the results were not extremely encouraging; only 23 insect species, one mite and nine fungi were reported to be associated with the plant. Hoary cress, a closely related weed you might be familiar with, has over 200 associated herbivorous organisms! However, the fact that relatively few organisms have been recorded on PPW does not mean that there are not more. The native range of PPW covers large areas in central Asia where few biologists have ever studied the local flora and fauna.

The next logical step was therefore to pack our bags, travel east, find PPW sites in the native range and examine all the organisms attacking

the plant. Our trips brought us to remote areas in Turkey, Russia, Iran, Kazakhstan, China and the Ukraine (Plate 1 & 2). During two years of field



Plate 1 - A PPW site in Wyoming? No, a field site in the Aras valley in Eastern Turkey!



Plate 2 - Our Russian colleagues, Boris Korotyayev and Sergey Reznik, collecting the gall-forming weevil, *Ceutorhynchus marginellus*.

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surveys, we reared and/or sampled 84 species of insects, mites and fungi, about 58 of which are recorded in the literature as being associated with the Brassicaceae, i.e. the plant family PPW belongs to. Of course not all of these organisms can be considered as potential biocontrol agents. Some

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are, in fact, known pests of cabbage, such as the diamondback moth and the cabbage curculio. However, we also found promising species and so far, we have identified five potential biocontrol agents. Below is a brief summary of them:

- **Melanobaris sp. n. pr. semistriata** is a root-mining weevil (Plate 3) that we have found at several field sites in Turkey. The weevil is particularly



Plate 3 - Adult of the root-mining weevil, *Melanobaris sp. n. pr. semistriata*



Plate 4 - Esther Gerber with our Turkish collaborator Levent Gültekin collecting the root-mining weevil, *Melanobaris sp. n. pr. semistriata*, in the Aras valley

abundant in sites along the Aras river in eastern Turkey (Plate 4). Molecular genetic analyses clearly distinguish the species found on PPW from the *Melanobaris* species currently being studied as a potential agent for hoary cress.

- The small, gall-forming weevil ***Ceutorhynchus marginellus*** (Plate 5) was found at field sites in Kazakhstan, southern Russia and western China. In the field, the occurrence of this species can easily be detected by feeding marks. Galls are formed on leaf midribs, leaf stalks and stems (Plate 6).

- Not much is known about ***Phyllotreta reitteri***, a stem-mining flea beetle that we found at field sites in Kazakhstan and southern Russia. Larval numbers can be very high and we observed that mining can cause die-back of shoots (Plate 7).
- ***Lasiosina deviata*** is a stem-mining fly that we found in Turkey and at one field site in



Plate 5 - Adult of the gall-forming weevil *Ceutorhynchus marginellus*



Plate 6 - Galls formed by larvae of the weevil, *Ceutorhynchus marginellus*



Plate 7 - Larva of the shoot-mining flea beetle, *Phyllotreta reitteri*

Kazakhstan. The species was given the name “*deviata*”, meaning “misguided”, because it is the only species in this genus known to be associated with a dicotyledonous plant.

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Lasiosina species usually develop on monocotyledonous plants, such as cereals and grasses. Our first host-specificity tests conducted in Turkey in collaboration with our Turkish partner Rüstem Hayat (Atatürk University, Erzurum) therefore concentrated on grass species (Plate 8). Fortunately, *L. deviata* did not

three beetles have proven to be very cooperative and lay eggs under the rather artificial conditions in quarantine. We were therefore able to establish rearing colonies and commence investigations on their host ranges. Tests are based on a test plant list containing nearly 100 Brassicaceae species, of which over 50% are native to North America. One important step in ensuring specificity of agents for PPW is to test whether they attack closely related native species. In this case, there are many native species in the same genus as PPW (*Lepidium*), 13 of which were included in the test plant list.

Results so far indicate that all species have a clear preference for PPW; however, all of the insects also laid eggs and/or developed in other *Lepidium* species. A next important step in the project is therefore to expose critical test plants to these insects under more natural conditions in the field. However, because none of these insect species occur in central Europe, we will have to conduct tests in the areas of the insects' origin. For 2009, we plan to conduct multiple-choice tests in field cages in southern Russia with the gall-forming weevil and the stem-mining flea beetle. This will only be possible thanks to the help of our Russian partners, Boris Korotyaev and Margarita Dolgovskaya and her team (Zoological Institute, Russian Academy of Sciences, St. Petersburg). First results of the tests should be available in June 2009. So look out for these results in our next Quarterly Report!



Plate 8 - Our Turkish collaborators setting up an open field test with the stem mining fly, *Lasiosina deviata*, in Turkey.

attack any of the exposed grasses and we can therefore continue considering this fly as a potential agent.

- At two sites in Turkey, we found plants attacked by what looked like eriophyid mites. We sent the attacked plant material to a mite specialist who identified the mite as a new species and named it *Metaculus lepidifolii*. Attack by this species can completely prevent flowering and/or seed production. Most eriophyid mites are highly host-specific and, given the great impact of this species on PPW, *M. lepidifolii* looks like a very promising candidate agent (Plate 9).



Plate 9 - PPW attacked by the eriophyid mite, *Metaculus lepidifolii*

Three of the potential agents, i.e. the root-mining and the gall forming weevils and the stem-mining flea beetle are currently being studied in quarantine. All



Wyo-Bio Mailing List

If you know of anyone who you think would like to receive a Wyo-Bio Newsletter and has not, please email the information to Roz@fcwp.org. If you would like to be removed from the mailing list you can write to the Fremont County Weed & Pest Control District, 450 North 2nd Street, Room 315, Lander, Wyoming, 82520-2371 or email your request to the above email address and your name will be removed. Anyone interested in receiving the Wyo-Bio newsletter electronically in a .pdf format please forward your email address. Check out our website at www.fcwp.org, each issue of the newsletter will be posted in full color on the website at the link www.fcwp.org/wyobio.

Availability of Weed Biological Control Insects in Wyoming

The Wyoming Weed & Pest Control Districts expect to have the following biological control agents available for redistribution in 2009. Feel free to contact the counties that have the agents that you need. Keep in mind that insect emergence and numbers depend on a number of factors and can be unpredictable.

WEED	INSECT AGENT	COUNTY	DATES AVAILABLE	CONTACT PERSON	PHONE	EMAIL
Leafy Spurge	<i>Aphthona</i> species	Crook	June - July	Ken Shackelton	283-2375	ccwp@rangeweb.net
	<i>Aphthona</i> species	Campbell	June - July	Allen Mooney	682-4369	alm76@ccg.co.campbell.wy.us
	<i>Spurgia esulae</i>	Fremont	May- June	Nancy Webber	332-1052	nancy@fcwp.org
	<i>Aphthona</i> species	Fremont	June - July	Nancy Webber	332-1052	nancy@fcwp.org
Dalmation Toadflax	<i>Mecinus janthinus</i>	Fremont	May - June	Nancy Webber	332-1052	nancy@fcwp.org
	<i>Mecinus janthinus</i>	Park	June	Josh Shorb	202-0133	pcwp@wir.net
Spotted Knapweed	<i>Cyphocleonus achates</i>	Johnson	July	Rod Litzel	684-5715	jcweedpest@ven.com
	<i>Agapeta zoegana</i>	Johnson	July	Rod Litzel	684-5715	jcweedpest@ven.com
Diffuse Knapweed	<i>Larinus minutus</i>	Johnson	July	Rod Litzel	684-5715	jcweedpest@ven.com
Canada Thistle	<i>Urophora cardui</i>	Fremont	Sept-Oct	Nancy Webber	332-1052	nancy@fcwp.org
	<i>Ceutorhynchus litura</i>	Goshen	July - August	Steve Brill	532-3713	gocoweeds@embarqmail.com
	<i>Ceutorhynchus litura</i>	Teton	August	Aaron Foster	733-8419	afoster@tcweed.org
Musk Thistle	<i>Trichosirocalus horridus</i>	Goshen	June - July	Steve Brill	532-3713	gocoweeds@embarqmail.com
Field Bindweed	<i>Aceria malherbae</i>	Fremont	June - August	Nancy Webber	332-1052	nancy@fcwp.org

